

## School Choice and Educational Stratification

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*Recent growth in the number of school choice programs across the country has ignited debate on the stratifying effects of these programs. In the context of interdistrict open enrollment, this paper analyzes—both theoretically and empirically—how choice programs affect stratification levels through the mechanisms of (i) the relative characteristics of program participants and nonparticipants and (ii) the schooling choices of different groups of program participants. The theoretical analysis uses Monte Carlo simulation techniques to analyze a hypothetical world where interdistrict choice is available to students in three school districts that are allowed to vary in student composition, the type of students who take advantage of the interdistrict choice program, and schooling choices of students who open enroll. The results of these simulations provide an understanding of the conditions under which an interdistrict open enrollment program leads to increases, decreases, or no changes in stratification levels. The empirical analysis uses data from the universe of students attending Colorado public schools in 2009–10 to examine how the state’s interdistrict choice program affects stratification levels. It also analyzes the factors responsible for any increases or decreases in stratification and finds both participation patterns and differences in schooling decisions across groups to play important roles. The paper concludes with a discussion of its implications for research and policy.*

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**KEY WORDS:** education policy, school choice, segregation, Monte Carlo simulation

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### Introduction

Across the country, legislation has produced a significant expansion in the number and breadth of school choice programs in recent years. Contentious debates over issues of educational equality have accompanied this policy expansion. Skeptics of school choice routinely contend that such policies have the potential to “cream” away the best students, “crop” away the worst, and thus result in greater levels of stratification along academic, socioeconomic, and racial dimensions (see Gutmann, 1987; Henig, 1994). School choice supporters generally respond that such concerns are not only unwarranted but that choice policies can actually decrease educational stratification by providing disadvantaged students with the ability to attend higher quality schools (Viteritti, 1999). The primacy of one position over the other is not immediately apparent; both represent plausible outcomes under different sets of circumstances.

There are two primary processes by which a given school choice policy can affect levels of educational stratification. First, stratification can be affected by the relative characteristics of households that do and do not utilize the choice policy. Commonly referred to as “selection,” this process has been the subject of both theoretical and empirical scholarship, most commonly in the context of school voucher and charter school policies (e.g., Figlio, Hart, & Metzger, 2010; Ni, 2012; Witte, 2000). However, even if program participants and nonparticipants are identical along all dimensions, stratification can be affected by variability in schooling choices across groups (Kleitz, Weiher, Tedin, & Matland, 2000; Schneider, Marshall, Teske, & Roch, 1998; Weiher & Tedin, 2002). For example, if high-achieving students use a choice policy to attend high-achieving districts and low-achieving households use the choice policy to attend lower-achieving districts, then levels of stratification could increase, regardless of the relative characteristics of program participants and nonparticipants.

In the context of interdistrict open enrollment, this paper analyzes—both theoretically and empirically—how levels of stratification are affected by the two factors identified above: (i) the relative characteristics of program participants and nonparticipants, and (ii) the schooling choices made by different groups of program participants. The theoretical analysis is based on a hypothetical world in which interdistrict choice is available to students in three school districts. Using Monte Carlo simulation techniques, the districts are allowed to vary in student composition, the type of students who take advantage of the interdistrict choice program, and the schooling choices of students who open enroll. The results of these simulations provide an understanding of the conditions under which an interdistrict open enrollment program leads to increases, decreases, or no changes in stratification levels. Following this theoretical analysis, focus turns to an empirical application. Specifically, using data from the universe of students attending Colorado public schools in 2009–10, I examine how the state’s interdistrict choice program affects stratification levels and analyze the factors responsible for any observed increases or decreases in those levels.

Several interesting results emerge from these analyses. The theoretical analysis reveals that, for the most part, the characteristics of program participants are a larger determinant of stratification levels than are the schooling choices made by participants. Results from the empirical analysis demonstrate that Colorado’s interdistrict choice program slightly increases socioeconomic stratification while decreasing racial stratification—the magnitude of the decrease in racial stratification is larger than the increase in socioeconomic stratification, but both changes are small from a substantive standpoint. The program has no meaningful effect on levels of academic stratification.

The paper proceeds by first reviewing existing work on the relationship between school choice and educational stratification. The focus then turns to developing a theoretical world in which students have the ability to participate in an interdistrict choice program and conducting Monte Carlo simulations to understand when interdistrict choice is likely—and is unlikely—to lead to increased levels of stratification. After discussing the results of the Monte Carlo analysis, the paper transitions to the empirical application, which begins with a discussion of interdistrict open

enrollment in Colorado—the setting for the empirical application—and a description of the data used in the analysis. The paper then assesses whether interdistrict open enrollment results in increased or decreased levels of educational stratification in Colorado and analyzes whether the observed increases or decreases are attributable to differences in the characteristics of participants and nonparticipants, heterogeneity in schooling choices of participants, or a combination of both factors. The paper concludes with a discussion of the research and policy implications of the findings.

### **Background on School Choice and Educational Stratification**

The theoretical relationship between school choice and educational stratification—whether along an academic, socioeconomic, racial, or other dimension—is ambiguous. Indeed, there are undoubtedly conditions under which school choice programs could both increase and decrease levels of educational stratification. Existing literature, however, has focused less on gaining a theoretical understanding of the conditions that produce increases or decreases in stratification and more on the empirical question of how school choice programs affect stratification levels. These empirical inquiries typically take one of the following two primary forms: (i) An analysis of whether students who participate in school choice programs are observably different—more or less advantaged—from their nonparticipating peers (e.g., Figlio et al., 2010; Fleming, Cowen, Witte, & Wolf, 2013; Witte, 2000; Witte & Thorn, 1996) or (ii) an examination of whether advantaged participants in choice program prefer higher quality schooling options than their less advantaged peers, commonly referred to as preference heterogeneity in the literature (e.g., Bifulco, Ladd, & Ross, 2009; Figlio et al., 2010; Schneider et al., 1998; Weiher & Tedin, 2002). Only rarely do studies address each of these two factors in concert (see Bifulco & Ladd, 2006; Bifulco et al., 2009; Figlio et al., 2010).<sup>1</sup>

#### *Student Selection into School Choice Programs*

Historically, the empirical literature on selection into school choice programs consisted primarily of studies conducted in the context of private school voucher programs (e.g., Campbell, West, & Peterson, 2005; Cowen, 2010; Figlio et al., 2010; Fleming et al., 2013; Howell, 2004; Howell & Peterson, 2002; Witte, 2000; Witte & Thorn, 1996; Wolf, Gutmann, Eissa, Puma, & Silverberg, 2005), but more recent analyses have contributed evidence from charter schools (Buckley & Schneider, 2007; Dee & Fu, 2004; Ni, 2012; Tuttle et al., 2013) and public school choice programs (Bifulco et al., 2009; Koedel, Betts, Rice, & Zau, 2009), including interdistrict open enrollment (Lavery & Carlson, 2014). As with any literature of this size and scope, singular studies often reach competing conclusions, but general trends do emerge.

When attempting to discern the general trends from this literature, it is important to recognize that participation in many choice programs is the result of a two-stage process—application and acceptance (i.e., enrollment)—and selection can occur at either stage. Studies of private school vouchers have been most effective at

separately analyzing the application and acceptance phases and thus provide the most complete body of evidence on the relationship between school choice policies and student demographic, socioeconomic, and academic characteristics. With respect to race, studies of participation in private school voucher programs have routinely shown African American students to be more likely than white students to submit an application (Campbell et al., 2005; Howell, 2004) but relatively less likely to accept a voucher offer (Cowen, 2010; Howell, 2004; Witte, 2000; Wolf et al., 2005). Additionally, prior work has typically shown voucher participants to be more advantaged on characteristics such as parental education (e.g., Fleming et al., 2013) and employment, as well as perceptions of the importance of education (Howell, 2004; Howell & Peterson, 2002; Witte, 2000).<sup>2</sup> Although present to a degree in both stages of the selection process, these differences were typically most pronounced in the acceptance stage.

Only a small number of studies have collected data on the prior achievement and other academic characteristics of voucher participants, and these studies return mixed results, with one set showing small positive advantages for voucher students (Belfield, 2005; Howell & Peterson, 2002; Wolf et al., 2005), but a more recent study from Florida's statewide program returning evidence of negative selection (Figlio et al., 2010). The sole study of the relationship between student disability status and participation in a voucher program finds special needs students to be underrepresented in the voucher program, although the discrepancy may not be as large as commonly perceived (Wolf, Witte, & Fleming, 2012).

Studies of other choice programs—particularly those focusing on charter schools—have produced similarly mixed findings regarding selection along racial, socioeconomic, and academic dimensions (Buckley & Schneider, 2007; Dee & Fu, 2004; Lacireno-Paquet, Holyoke, Moser, & Henig, 2002; Ni, 2012; Tuttle et al., 2013). The only existing study of the selection effects of interdistrict choice programs was conducted in the context of Colorado's statewide program and finds program participants to be disproportionately black and ineligible to receive free- or reduced-price lunch (Lavery & Carlson, 2014).<sup>3</sup> Furthermore, echoing the findings of Wolf et al. (2012), the Lavery and Carlson (2014) study finds students with special designations—English language learners, special needs, and gifted and talented—to be disproportionately unlikely to participate in the interdistrict choice program. Academically, the study finds open enrollers to have slightly higher reading scores, but slightly lower math scores, relative to nonparticipants. Considered as a whole, the literature on the selection effects of school choice programs is decidedly mixed; there are some contexts in which it occurs and others in which it does not. In all cases, however, the estimated effects are substantively small, even if they are statistically significant.

### *School Choice and Heterogeneity in Preferences and Schooling Decisions*

The literature on preference heterogeneity across families with varying socioeconomic and demographic characteristics can usefully be divided into two groups

of studies: (i) those who draw conclusions from the stated preferences of program participants and (ii) those who rely on revealed preferences as the basis for their inferences; these two groups of studies reach quite different conclusions. In general, the studies that rely on stated preferences find, if anything, only slight differences in the dimensions of education that families with different socioeconomic and racial backgrounds deem important (see discussion in Buckley & Schneider, 2007; Kleitz et al., 2000; Schneider et al., 1998; Weiher & Tedin, 2002). Furthermore, these studies routinely find that racial considerations play no effective role in families' schooling decisions. Analyses that rely on families' revealed preferences as the basis for their inferences, however, demonstrate otherwise. Indeed, the single most common finding emerging from studies of revealed preference heterogeneity is one of racial homophily—white families prefer schools with overwhelmingly white student bodies while black families prefer schools that enroll a disproportionate number of black students (Bifulco & Ladd, 2006; Bifulco et al., 2009; Buckley & Schneider, 2007; Weiher & Tedin, 2002; but see Figlio et al., 2010). Fewer studies have analyzed potential preference heterogeneity in the context of academic quality, but Weiher and Tedin (2002) provide convincing evidence that—in the context of charter schools—parents with high levels of education send their children to higher quality schools than do less educated parents. Taken together, the best studies of preference heterogeneity—those that rely on revealed preferences—demonstrate that such heterogeneity does indeed exist and is most visible on the dimension of race.

The majority of studies relevant to school choice and educational stratification begin and end with an analysis of whether—in the context of a given choice program—selection or preference heterogeneity exists. A number of studies, however, go further and attempt to determine how the choice program affects stratification levels in the larger educational environment (e.g., Bifulco & Ladd, 2006; Bifulco et al., 2009; Figlio et al., 2010; Greene, 1999; Greene & Winters, 2006; Greene, Mills, & Buck, 2010; Ni, 2012). A selection of these studies return at least some evidence that school choice programs result in increased levels of racial and ethnic stratification, although the magnitudes of the estimated effects are typically small (Bifulco & Ladd, 2006; Bifulco et al., 2009; Figlio et al., 2010; Ni, 2012). A second set of studies, however, conclude that school choice programs have either no effect on overall segregation levels or slightly integrative effects (Greene, 1999; Greene & Winters, 2006; Greene et al., 2010). Assessing the conditions under which school choice programs have integrative versus segregating effects is the goal of the theoretical analysis presented in the following section.

## Theory, Model, and Simulations

### *Theoretical Setup*

Consider a theoretical world in which there are three school districts—A, B, and C—and interdistrict open enrollment is available to students in each district. These districts differ in size, with District B containing 75,000 students and

Districts A and C each enrolling 60,000. Within each district, there are two types of students—low-achieving students and high-achieving students—and the districts differ in their proportions of each student type.<sup>4</sup> District A has roughly equal numbers of low- and high-achieving students; District B has more low- than high-achieving students; and District C has more high- than low-achieving students.<sup>5</sup> This three-district configuration is designed to mirror the dynamics present in many large urban areas—a large, disproportionately low-income and low-achieving central city district surrounded by smaller suburban districts with varying levels of affluence and achievement.

Although interdistrict open enrollment is available to students in all three districts, the districts vary in the proportion of students who participate in the program. District B, the low-income, low-achieving central city district, has a relatively high participation rate, whereas District C—the affluent district—has a low participation rate. The participation rate for District A falls in between. Within each district, the group of open enrollers can exhibit one of three achievement profiles: (i) disproportionately lower achieving than students who do not open enroll, (ii) disproportionately higher achieving than students who do not open enroll, and (iii) no different from students who do not open enroll.

In this three-district world, students who open enroll consider a single dimension—achievement—when determining the district into which they will open enroll. Specifically, within each district, the group of open enrollers can have one of four preference types. First, the open enrollers can uniformly prefer the highest achieving district. Second, the two different types of students in the group of open enrollers can have stratified preferences where they prefer the district with more students of their type; high-achieving students will prefer the high-achieving district and low-achieving students will prefer the low-achieving district. Third, the open enrollers can have random preferences; they equally prefer each type of district. Fourth, the two different types of students can have preferences whereby the high-achieving students will prefer the high-achieving district and the low-achieving students equally prefer the high- and low-achieving district.<sup>6</sup> Table 1 summarizes the characteristics of this theoretical world.

### *Monte Carlo Simulations*

Given the theoretical world described above, I use Monte Carlo simulations to assess how interdistrict choice could affect stratification levels across districts, at least along a single dimension—assumed to be achievement in this case. This Monte Carlo analysis is based on 30 million trials in which—separately for each trial and for each of the three districts—values for the following district characteristics are randomly drawn from specified distributions: (i) the proportion of low-achieving students, (ii) the interdistrict open enrollment participation rate, (iii) the achievement profile of open enrollers, and (iv) the schooling preferences of open enrollers. The parameters chosen to characterize these distributions are informed by both empirical observations and the results of studies reviewed above.



Table 1. Characteristics of Theoretical World with Interdistrict Open Enrollment

Characteristic	Description
Number of districts	3
District enrollment	
District A	60,000
District B	75,000
District C	60,000
Student type	
1	Low achieving
2	High achieving
District composition	
District A	Equal low and high achievers
District B	More low achievers than high achievers
District C	More high achievers than low achievers
Achievement profiles of open enrollers	
1	Disproportionately low achieving
2	Proportional to district achievement profile
3	Disproportionately high achieving
Preferences for entry district	
1	Uniformly prefer highest achieving
2	Stratified, same as type
3	No systematic preference
4	High achieving prefer high achieving, low achieving have no systematic preference

It is important to note that these simulations are intended to provide an understanding of the logical relationships between stratification levels and interdistrict choice under various conditions, rather than clarify the predictions of a behavioral model. As such, certain features are absent from the simulations, such as recognition that the composition of a district is affected by interdistrict choice or the reality that families’ decisions to participate in interdistrict open enrollment are not independent of the enrollment decisions made under interdistrict choice policies. Such absences are not problematic given the purpose of the simulations—clarifying the mechanical relationships between participant characteristics, schooling choices, and stratification levels. In and of itself, such clarification represents a valuable contribution of these simulations. Contemporary debates over school choice policy are rife with competing claims over the likely effect of a school choice program on stratification levels, and the contents of these debates demonstrate a clear failure to understand how the characteristics and schooling decisions of participants relate to possible changes in stratification levels. Through analysis of a theoretical world designed to mirror the educational reality in many metropolitan areas, the simulations will bring greater clarity to the conditions under which a school choice program is likely to lead to increased or decreased stratification levels. They can provide insight into whether, for a given set of schooling decisions made by participants, stratification is likely to increase or decrease if participants possess one profile, as opposed to another. They can provide information on the extent that, given the profile of participants, schooling decisions made by participants are related to changes in stratification levels. Such clarity can help inform ongoing and future policy debates.

*Simulation Details.* As noted above, the three districts in the theoretical world vary on several dimensions. The general contours of this variation were described above, but I provide the details here. For each trial, the proportion of low-achieving students in District A is randomly drawn from a uniform distribution that ranges from 40 to 60 percent of student enrollment.<sup>7</sup> Put another way, given its total enrollment of 60,000 students, District A has equal probability of enrolling any number of low-achieving students between a minimum of 24,000 and a maximum of 36,000. In District B, the proportion of low-achieving students is randomly drawn from distribution that varies uniformly from 50 percent to 100 percent. This corresponds to District B having—with equal probability—anywhere between 37,500 and 75,000 low-achieving students. In the relatively affluent District C, the distribution from which the proportion of low-achieving students is drawn is a uniform one that ranges from a minimum of zero to a maximum of 50 percent.

The three districts also vary in the proportion of students that participate in the open enrollment program. For each trial, the participation rate for each district is drawn from a uniform distribution, but the specifics of the distribution vary across districts. In District A, the participation rate has an equal probability—in each trial—of taking on any value from a minimum of 3 percent to a maximum of 20 percent. The distribution of potential participation rates for District B ranges from 5 to 30 percent, whereas District C can be assigned rates ranging from 0 to 5 percent of students.

Along with randomly drawing the proportion of low-achieving students and the open enrollment participation rate for each district, the Monte Carlo analysis also randomly determines the achievement profile of open enrollers as well as their schooling preferences. For these two characteristics, each district has—for each trial—an equal probability of taking on any of the categories that comprise the characteristic. As an example, in determining the achievement profile of open enrollers, each district has a probability of 0.33 of being assigned each of the following three profiles: (i) disproportionately low achieving, (ii) proportional to the overall achievement profile of the district (i.e., low- and high-achieving students are equally likely to participate), or (iii) disproportionately high achieving.<sup>8</sup> It is important to note that, within each trial, the achievement profile of open enrollers in each district is drawn independently. Consequently, the achievement profile of open enrollers in District A can—and typically does—differ from the achievement profile of open enrollers in Districts B and C. A similar scenario occurs with respect to determining the schooling preferences of open enrollers in each district. Specifically, for each trial, the three districts each has a probability of 0.25 of being assigned each of the four categories of entry district preferences outlined in Table 1. As was the case with achievement profiles, the category of schooling preferences for open enrollers in each district is drawn independently for each district.

After randomly drawing all parameters and having the open enrollment process take place, the final step in the Monte Carlo simulation involves determining whether that process resulted in increased, decreased, or unchanged levels of stratification. To gauge levels of stratification across the districts, I rely on two distinct measures. First, I use the index of dissimilarity, which is a standard measure of the



degree that two groups—in this case low and high achievers—are distributed across geographic units, in this case school districts (White, 1983). The index—represented by  $D$  in the equation below—can be expressed formally as:

$$D = \frac{1}{2} \sum_{i=1}^N \left| \frac{h_i}{H} - \frac{l_i}{L} \right| \quad (1)$$

where—for the three aforementioned districts— $h$  is the number of high-achieving students in district  $i$ ,  $l$  is the number of low-achieving students in district  $i$  and  $H$  and  $L$  are the total number of high- and low-achieving students in the three districts, respectively. Intuitively, the index of dissimilarity represents the ratio of the number of members of a group that must be moved from units where the group is overrepresented—relative to the total population—to units where the group is underrepresented in order to achieve equal distribution across the units. To assess whether the open enrollment process produced increased, decreased, or unchanged levels of stratification, I use the change in the dissimilarity index,  $C$ , before and after the choice process took place. More formally,

$$C = \left( \frac{1}{2} \sum_{i=1}^N \left| \frac{h_{ia}}{H} - \frac{l_{ia}}{L} \right| \right) - \left( \frac{1}{2} \sum_{i=1}^N \left| \frac{h_{ib}}{H} - \frac{l_{ib}}{L} \right| \right) \quad (2)$$

where  $a$  represents the time period after open enrollment occurs,  $b$  represents the time period prior to the school choice program taking place, and the remaining contents of the equation were described above. This change in the dissimilarity index resulting from the interdistrict open enrollment process is calculated for each of the 30 million trials in the Monte Carlo simulation.

In addition to the index of dissimilarity, I use the isolation index as a second measure of interdistrict stratification. The isolation index can be interpreted as the percentage of low-achieving students who live in the geographic unit—in this case the school district—where the average low-achieving student resides. The isolation index can be written as:

$$S = \sum_{i=1}^N \left( \frac{l_i}{L} \right) \left( \frac{l_i}{l_i + h_i} \right) \quad (3)$$

As with the dissimilarity index, I use the change in the isolation index,  $O$ , before and after the choice process occurred to gain insight into the manner in which interdistrict open enrollment affected cross-district stratification levels. This change can be expressed as:

$$O = \left( \sum_{i=1}^N \left( \frac{l_{ia}}{L} \right) \left( \frac{l_{ia}}{l_{ia} + h_{ia}} \right) \right) - \left( \sum_{i=1}^N \left( \frac{l_{ib}}{L} \right) \left( \frac{l_{ib}}{l_{ib} + h_{ib}} \right) \right) \quad (4)$$

As with the dissimilarity index, the change in the isolation index is calculated for each of the 30 million trials of the simulation. Glaeser and Vigdor (2001) note that

these two indices capture separate, if empirically correlated, dimensions of segregation; the dissimilarity index gauges how evenly members of a group are spread across geographic units, whereas the isolation index measures the extent to which an individual member of a specific group is surrounded by other members of that group.<sup>9</sup>

### *Results*

Although the large number of variable parameters in the Monte Carlo procedure results in numerous options for presenting the simulation results, the most logical starting point is one that reflects the tenor of most school choice debates, which generally focus on the effects in the large—generally poor and low achieving—central city district. Consequently, I begin by presenting the simulation results under assumptions about the type of students in District B who participate in the choice program, as well as their schooling choices. However, there are additional questions of interest—such as whether the effect of choice on stratification is conditional upon the initial level of segregation or how supply constraints affect stratification levels—that I also address via the simulation results.

*Focus on District B.* Assuming interdistrict open enrollment participants in District B to be disproportionately low achieving, the first two columns of Table 2 present the average change in the dissimilarity and isolation indexes from pre- to postchoice for each combination of the three open enrollment types and four preference types detailed in Table 1. The columns also present the standard deviations of the distributions of changes, as well as the proportion of trials that decrease stratification.<sup>10</sup> The results for the dissimilarity index demonstrate that when open enrollment participants in District B are disproportionately low achieving, the implementation of an interdistrict choice program usually decreases cross-district stratification levels on the achievement dimension. Indeed, across each of the four possible schooling preferences held by participants, interdistrict choice resulted in a decrease in stratification in at least 82 percent of trials. The isolation index results generally mirror those of the dissimilarity index, although for all four preference types, open enrollment decreased stratification in a larger proportion of trials for the isolation index than for the dissimilarity index.<sup>11</sup>

The third and fourth columns of Table 2 present results analogous to those in the first two columns but under the assumption that the group of program participants in District B are proportional to the number of low- and high-achieving students in the district. The dissimilarity index results again demonstrate that the choice program is likely to produce decreases in stratification; the proportion of trials in which stratification declines ranges from a low of 67 percent when low- and high-achieving students had stratified preferences to a high of 99 percent when low- and high-achieving open enrollers were equally likely to enroll into each of the two other districts. The isolation index results reveal that over 90 percent of trials resulted in decreased stratification when participants had preference types 1, 3, or 4. However,

**Table 2.** Simulated Relationship between Interdistrict Choice Program and Stratification Levels by Open Enrollment Type and Preference Type for Students in District B (Large, Disproportionately Low-Achieving District)

	OE Type 1			OE Type 2			OE Type 3		
	Dissimilarity Index	Isolation Index	Preference Type 1	Dissimilarity Index	Isolation Index	Preference Type 2	Dissimilarity Index	Isolation Index	Preference Type 3
Average change in segregation	-0.080	-0.064		-0.059	-0.043		0.025	0.022	
Standard deviation	0.047	0.033		0.037	0.029		0.051	0.037	
Proportion of trials decreasing segregation	0.989	1.000		0.992	0.995		0.311	0.256	
Average change in segregation	-0.046	-0.023	Preference Type 1	-0.033	-0.006	Preference Type 2	0.032	0.039	Preference Type 3
Standard deviation	0.053	0.021		0.049	0.018		0.047	0.030	
Proportion of trials decreasing segregation	0.823	0.878		0.671	0.585		0.225	0.064	
Average change in segregation	-0.065	-0.049	Preference Type 1	-0.050	-0.030	Preference Type 2	0.022	0.021	Preference Type 3
Standard deviation	0.040	0.025		0.036	0.021		0.048	0.029	
Proportion of trials decreasing segregation	0.985	1.000		0.997	0.992		0.318	0.205	
Average change in segregation	-0.064	-0.048	Preference Type 1	-0.046	-0.027	Preference Type 2	0.029	0.030	Preference Type 3
Standard deviation	0.041	0.026		0.039	0.023		0.048	0.033	
Proportion of trials decreasing segregation	0.978	0.998		0.950	0.912		0.264	0.160	

*Note:* OE Type refers to the achievement profile of open enrollment participants. Type 1 refers to a case where participants are disproportionately low achieving. Type 2 refers to a case where participants are proportional to the overall achievement profile of the district (i.e., low- and high-achieving students are equally likely to participate). Type 3 refers to a case where participants are disproportionately high achieving. Preference type refers to the schooling decisions that low- and high-achieving students make under open enrollment. Under preference type 1, both low- and high-achieving students open enroll into the best available district. Under preference type 2, low- and high-achieving students have stratified preferences—each type of student enrolls into the district with more of their own type. Under preference type 3, both low- and high-achieving students are equally likely to enroll in each available option. Under preference type 4, high-achieving students enroll in the best available option, whereas low-achieving students are equally likely to enroll in each available option.

only slightly more than half of trials decreased stratification when participants were assumed to have stratified preferences.

The results in the fifth and sixth columns of Table 2 were obtained under the assumption that the set of students in District B participating in the interdistrict choice program was disproportionately high achieving. Perhaps not surprisingly, under these conditions, the interdistrict choice program usually—but not always—results in greater levels of stratification. Considering both the dissimilarity and isolation indexes, the proportion of trials decreasing stratification ranges from a high of 0.318 to a low of 0.064. Although there is variation in the results across preference types, overall the simulations suggest that interdistrict choice is likely to increase stratification when participants in the large, disadvantaged district are disproportionately high achieving.<sup>12</sup>

*Level of Initial Segregation.* It is possible that the effect of interdistrict choice on stratification levels varies by the amount of initial segregation. The simulation setup produces a large range of initial segregation, which I exploit to analyze this possibility.<sup>13</sup> In this analysis, I first categorize each simulation trial into one of three groups: low initial segregation, medium initial segregation, and high initial segregation. I define a trial as having low initial segregation if the value of the segregation measure falls below the 25th percentile of the observed range of initial segregation, whereas a trial is considered to have high initial segregation if the value of the segregation measure is above the 75th percentile; a trial is classified as having medium initial segregation if the segregation measure is between the 25th and 75th percentiles.<sup>14</sup>

Tables 3–5 present the average change in segregation before and after interdistrict choice; the standard deviation of the distribution of changes; and the proportion of trials that decrease segregation for low, medium, and high levels of initial segregation, respectively. In each table, results are presented for each combination of the three types of open enrollment participants and four classes of preferences. Inspection of the tables makes clear that—for each combination of participant characteristics and preference type—interdistrict choice decreases stratification in a larger proportion of trials as the initial level of segregation increases. Depending on the specific combination of participant characteristics and schooling preferences, going from low to high levels of initial segregation increases the percentage of trials that decrease stratification by anywhere from about 5 to 45 percentage points. Although this relationship is present across all combinations of open enrollment participant characteristics and schooling preferences, from an absolute standpoint, some combinations are still clearly more likely to reduce stratification than others.

*Supply Constraint.* To this point, the simulations have implicitly been conducted under the assumption of no supply constraints—without exception, participants' enrollment decisions have been dictated solely by their schooling preferences. In reality, some districts may accept only a limited number of students through interdistrict open enrollment, if they even accept any at all. Consequently, I present a final set of simulation results that are obtained under assumptions of a supply

Table 3. Simulated Relationship between Interdistrict Choice Program and Stratification Levels by Open Enrollment Type and Preference Type for Trials with Low Initial Stratification Levels

	OE Type 1			OE Type 2			OE Type 3		
	Dissimilarity Index	Isolation Index		Dissimilarity Index	Isolation Index		Dissimilarity Index	Isolation Index	
Average change in segregation	-0.051	-0.051		<i>Preference Type 1</i>					
Standard deviation	0.038	0.029		-0.024	-0.022		0.037	0.026	
Proportion of trials decreasing segregation	0.956	1.000		0.016	0.017		0.046	0.030	
				0.968	0.980		0.203	0.165	
Average change in segregation	-0.017	-0.004		<i>Preference Type 2</i>					
Standard deviation	0.040	0.013		-0.008	0.014		0.040	0.044	
Proportion of trials decreasing segregation	0.700	0.634		0.030	0.009		0.042	0.025	
				0.502	0.024		0.149	0.000	
Average change in segregation	-0.038	-0.033		<i>Preference Type 3</i>					
Standard deviation	0.031	0.019		-0.022	-0.013		0.035	0.022	
Proportion of trials decreasing segregation	0.941	1.000		0.015	0.010		0.047	0.022	
				0.987	0.968		0.208	0.114	
Average change in segregation	-0.036	-0.030		<i>Preference Type 4</i>					
Standard deviation	0.032	0.019		-0.016	-0.006		0.039	0.035	
Proportion of trials decreasing segregation	0.918	0.993		0.020	0.010		0.045	0.026	
				0.806	0.677		0.166	0.041	

Note: A trial is classified as having a low initial stratification level if the value of the segregation measure falls below the 25th percentile of the observed range of initial segregation levels for all trials. OE Type refers to the achievement profile of open enrollment participants. Type 1 refers to a case where participants are disproportionately low achieving. Type 2 refers to a case where participants are proportional to the overall achievement profile of the district (i.e., low- and high-achieving students are equally likely to participate). Type 3 refers to a case where participants are disproportionately high achieving. Preference type refers to the schooling decisions that low- and high-achieving students make under open enrollment. Under preference type 1, both low- and high-achieving students open enrollment into the best available district. Under preference type 2, low- and high-achieving students have stratified preferences—each type of student enrolls into the district with more of their own type. Under preference type 3, both low- and high-achieving students are equally likely to enroll in each available option. Under preference type 4, high-achieving students enroll in the best available option, whereas low-achieving students are equally likely to enroll in each available option.

**Table 4.** Simulated Relationship between Interdistrict Choice Program and Stratification Levels by Open Enrollment Type and Preference Type for Trials with Medium Initial Stratification Levels

	OE Type 1			OE Type 2			OE Type 3		
	Dissimilarity Index	Isolation Index		Dissimilarity Index	Isolation Index		Dissimilarity Index	Isolation Index	
Average change in segregation	-0.085	-0.064		<i>Preference Type 1</i>			0.027		0.027
Standard deviation	0.044	0.031		-0.060	-0.041		0.053		0.040
Proportion of trials decreasing segregation	1.000	1.000		0.027	0.023		0.328		0.258
				1.000	1.000				
Average change in segregation	-0.044	-0.022		<i>Preference Type 2</i>			0.037		0.045
Standard deviation	0.050	0.016		-0.030	-0.004		0.048		0.031
Proportion of trials decreasing segregation	0.815	0.937		0.047	0.011		0.191		0.029
				0.634	0.658				
Average change in segregation	-0.066	-0.049		<i>Preference Type 3</i>			0.024		0.026
Standard deviation	0.034	0.022		-0.049	-0.028		0.048		0.031
Proportion of trials decreasing segregation	0.998	1.000		0.028	0.015		0.326		0.197
				1.000	1.000				
Average change in segregation	-0.065	-0.047		<i>Preference Type 4</i>			0.033		0.035
Standard deviation	0.035	0.023		-0.044	-0.025		0.050		0.036
Proportion of trials decreasing segregation	0.997	1.000		0.030	0.015		0.252		0.147
				0.999	0.989				

*Note:* A trial is classified as having a medium initial stratification level if the value of the segregation measure falls between the 25th and 75th percentiles of the observed range of initial segregation levels for all trials. OE Type refers to the achievement profile of open enrollment participants. Type 1 refers to a case where participants are disproportionately low achieving. Type 2 refers to a case where participants are proportional to the overall achievement profile of the district (i.e., low- and high-achieving students are equally likely to participate). Type 3 refers to a case where participants are disproportionately high achieving. Preference type refers to the schooling decisions that low- and high-achieving students make under open enrollment. Under preference type 1, both low- and high-achieving students open enroll into the best available district. Under preference type 2, low- and high-achieving students have stratified preferences—each type of student enrolls into the district with more of their own type. Under preference type 3, both low- and high-achieving students are equally likely to enroll in each available option. Under preference type 4, high-achieving students enroll in the best available option, whereas low-achieving students are equally likely to enroll in each available option.



Table 5. Simulated Relationship between Interdistrict Choice Program and Stratification Levels by Open Enrollment Type and Preference Type for Trials with High Initial Stratification Levels

	OE Type 1			OE Type 2			OE Type 3		
	Dissimilarity Index	Isolation Index		Dissimilarity Index	Isolation Index		Dissimilarity Index	Isolation Index	
Average change in segregation	-0.101	-0.079		<i>Preference Type 1</i>					
Standard deviation	0.044	0.035		-0.092	-0.068		0.007	0.008	
Proportion of trials decreasing segregation	1.000	1.000		0.040	0.031		0.047	0.034	
				1.000	1.000		0.382	0.346	
Average change in segregation	-0.077	-0.044		<i>Preference Type 2</i>					
Standard deviation	0.052	0.016		-0.065	-0.029		0.014	0.021	
Proportion of trials decreasing segregation	0.965	1.000		0.051	0.010		0.046	0.025	
				0.911	1.000		0.368	0.197	
Average change in segregation	-0.090	-0.066		<i>Preference Type 3</i>					
Standard deviation	0.041	0.025		-0.081	-0.051		0.005	0.010	
Proportion of trials decreasing segregation	1.000	1.000		0.041	0.021		0.042	0.026	
				1.000	1.000		0.408	0.310	
Average change in segregation	-0.090	-0.067		<i>Preference Type 4</i>					
Standard deviation	0.042	0.025		-0.081	-0.052		0.010	0.013	
Proportion of trials decreasing segregation	1.000	1.000		0.042	0.021		0.045	0.028	
				1.000	1.000		0.389	0.305	

Note: A trial is classified as having a high initial stratification level if the value of the segregation measure falls above the 75th percentile of the observed range of initial segregation levels for all trials. OE Type refers to the achievement profile of open enrollment participants. Type 1 refers to a case where participants are disproportionately low achieving. Type 2 refers to a case where participants are proportional to the overall achievement profile of the district (i.e., low- and high-achieving students are equally likely to participate). Type 3 refers to a case where participants are disproportionately high achieving. Preference type refers to the schooling decisions that low- and high-achieving students make under open enrollment. Under preference type 1, both low- and high-achieving students open enroll into the best available district. Under preference type 2, low- and high-achieving students have stratified preferences—each type of student enrolls into the district with more of their own type. Under preference type 3, both low- and high-achieving students are equally likely to enroll in each available option. Under preference type 4, high-achieving students enroll in the best available option, whereas low-achieving students are equally likely to enroll in each available option.

constraint. Specifically, reflecting the reality that high-achieving districts are most likely to have a limited supply of seats, I conduct this simulation under the assumption that students whose preferences would dictate open enrolling into District C—the high-achieving district—only have a 10 percent chance of being able to enroll in that district. Put differently, only 10 percent of open enrollers whose preferences would lead them to enroll into District C are able to actually do so; the other 90 percent still open enroll but are forced into the other district option. I assume that District C does not privilege either low- or high-achieving students when determining which students will be permitted to open enroll into the district.

Table 6 presents the simulation results obtained under the supply constraints outlined above. Three main findings emerge from the results. First, there is little substantive difference in the proportion of trials that reduce stratification with and without a supply constraint when open enrollers are assumed to be disproportionately low achieving (see Table 2 for comparison). The proportion of trials that decrease stratification is slightly higher under the supply constraint for some preference types but slightly lower for others. From an absolute perspective, interdistrict choice is still quite likely to result in a decline in stratification when open enrollers are disproportionately low achieving. Second, when the composition of open enrollment participants is assumed proportional to district composition (i.e., OE Type 2), interdistrict choice under a supply constraint generally leads to either an increase or no meaningful change in the proportion of trials in which interdistrict choice decreases segregation, relative to interdistrict choice occurring under no such constraints. The largest change occurs when the two types of open enrollers are assumed to have stratified preferences. Without supply constraints, interdistrict choice reduces stratification levels in either 59 or 67 percent of trials, depending on the measure of segregation. Under supply constraints, however, the choice program leads to declines in stratification in about 95 percent of trials under each segregation measure. Finally, when open enrollers are disproportionately advantaged and District C has a limited number of seats, interdistrict choice is slightly more likely across all categories to result in decreased stratification, relative to a similar context without a supply constraint.

Upon first glance, these results may seem somewhat surprising. It is typically assumed in debates over school choice policy that space constraints in high-performing districts contribute to increased levels of stratification. The results presented in Table 6 suggest otherwise, however, particularly when open enrollment participants are either disproportionately advantaged or proportional to nonparticipants. This counterintuitive finding is attributable to the fact that, although the supply constraint affects all transferring students, because of the defined characteristics of open enrollment participants it affects a greater number of high-achieving students, forcing them to make integrating—rather than segregating—moves.

Taken together, the results of the Monte Carlo simulations generate several important insights. First, given the theoretical world I develop, the results in Table 2 indicate that for a given profile of participant characteristics, the schooling choices made by participants had relatively little effect of the proportion of trials decreasing stratification. This suggests that the stratifying effects of Colorado's interdistrict

**Table 6.** Simulated Relationship between Interdistrict Choice Program and Stratification Levels under Supply Constraint by Open Enrollment and Preference Type for All Districts

	OE Type 1			OE Type 2			OE Type 3		
	Dissimilarity Index	Isolation Index		Dissimilarity Index	Isolation Index		Dissimilarity Index	Isolation Index	
Average change in segregation	-0.051	-0.030		<i>Preference Type 1</i>					
Standard deviation	0.046	0.018		-0.044	-0.019		0.021	0.020	
Proportion of trials decreasing segregation	0.938	0.983		0.039	0.014		0.049	0.023	
				0.999	0.982		0.343	0.157	
Average change in segregation	-0.050	-0.028		<i>Preference Type 2</i>					
Standard deviation	0.049	0.018		-0.043	-0.015		0.020	0.021	
Proportion of trials decreasing segregation	0.923	0.971		0.042	0.013		0.048	0.022	
				0.965	0.949		0.330	0.137	
Average change in segregation	-0.052	-0.031		<i>Preference Type 3</i>					
Standard deviation	0.046	0.018		-0.044	-0.018		0.021	0.021	
Proportion of trials decreasing segregation	0.948	0.988		0.040	0.014		0.048	0.023	
				0.999	0.978		0.330	0.139	
Average change in segregation	-0.053	-0.032		<i>Preference Type 4</i>					
Standard deviation	0.046	0.019		-0.045	-0.019		0.021	0.019	
Proportion of trials decreasing segregation	0.952	0.990		0.040	0.014		0.049	0.023	
				0.999	0.988		0.352	0.170	

*Note:* Under the supply constraint, only 10 percent of students that would like to enroll into the best available option are able to do so. OE Type refers to the achievement profile of open enrollment participants. Type 1 refers to a case where participants are disproportionately low achieving. Type 2 refers to a case where participants are proportional to the overall achievement profile of the district (i.e., low- and high-achieving students are equally likely to participate). Type 3 refers to a case where participants are disproportionately high achieving. Preference type refers to the schooling decisions that low- and high-achieving students make under open enrollment. Under preference type 1, both low- and high-achieving students open enrollment into the best available district. Under preference type 2, low- and high-achieving students have stratified preferences—each type of student enrolls into the district with more of their own type. Under preference type 3, both low- and high-achieving students are equally likely to enroll in each available option. Under preference type 4, high-achieving students enroll in the best available option, whereas low-achieving students are equally likely to enroll in each available option.

choice program may be primarily determined by the profiles of students who participate, as opposed to heterogeneity in the schooling decisions of participants, a conjecture I test below. Second, with a small number of exceptions, the simulation results demonstrate that the dissimilarity and isolation indexes generally return substantively similar conclusions. This finding implies that interdistrict choice does not generally affect the two dimensions of segregation in different ways. Third, the results in Tables 3–5 indicate that the proportion of trials in which interdistrict choice decreases stratification increases with the level of initial segregation. This suggests that interdistrict choice is likely to have different stratifying effects in a highly segregated environment than a less-segregated context. Fourth, the results in Table 6 imply that, in most cases, supply constraints in high-achieving districts will serve to slightly increase the likelihood that interdistrict choice will produce a decline in stratification, at least relative to a context where no such supply constraints are present. I discuss the implications of these findings in further detail in the concluding section of the paper.

### Empirical Analysis

The previous section clearly demonstrates that—under different sets of conditions—interdistrict open enrollment policies can result in both increases and decreases in stratification levels. Gaining a theoretical understanding of the range of possible stratifying effects of school choice programs is important, but perhaps even more valuable is empirically analyzing the effects of these programs in real-world settings. Below, I assess whether Colorado’s interdistrict open enrollment program increases or decreases cross-district stratification levels along several dimensions. Although most recent studies have focused on levels of segregation across schools within a district (e.g., Bifulco et al., 2009; Figlio et al., 2010; Ni, 2012), there is a long history of concern with segregation levels across districts, particularly across districts within a specific metropolitan area. Indeed, such concerns served as the basis for establishing desegregation programs—in places like Milwaukee, St. Louis, and other metropolitan areas—that moved students across district lines. Though modified from their original form, several of these programs remain in effect today, indicating continued concern over between-district segregation levels.<sup>15</sup> Furthermore, political supporters of interdistrict open enrollment programs—by definition a cross-district choice program—often cite decreased levels of segregation as a potential benefit in policy debates.<sup>16</sup> All of which is to say that segregation levels between districts have been, and remain, a salient aspect of the policy environment.

#### *Background on Interdistrict Open Enrollment Policies*

Like other school choice policies, interdistrict open enrollment programs are a relatively recent addition to the educational landscape. Voluntary programs only began to emerge as a schooling option in the early 1980s, and the first mandatory statewide program did not exist until the implementation of Minnesota’s policy in

1991 (Boyd, Hare, & Nathan, 2002).<sup>17</sup> Since enactment of that program, however, interdistrict open enrollment has expanded rapidly, and by 2011, only eight states and the District of Columbia were without some form of the policy (National Center for Education Statistics, 2012).<sup>18</sup>

Because the empirical analyses to follow draw on data from the mandatory interdistrict open enrollment program in Colorado, I discuss this class of policy—both generally and in the specific context of Colorado—in further detail. The specifics of mandatory interdistrict open enrollment policies clearly vary across states, but there are three features that nearly all programs possess. First, and most basically, the policies create a process through which students can attend public schools located in a district other than the one in which they reside. Historically, public school students have been required—with few exceptions—to attend the school specified by their district of residence. Second, open enrollment policies generally specify a set of conditions under which school districts can refuse to accept interdistrict transfers. The list of allowable conditions for transfer refusal is uniquely determined by each state's policy, but two of the most common conditions on these lists include a lack of capacity in the district and an applicant's history of behavioral problems, such as suspensions, expulsions, or substance abuse. Third, interdistrict transfer programs are generally designed in a manner such that state education aid associated with a transferring student is disbursed to the district of attendance, rather than the district of residence. The precise amount of funding a district receives for each interdistrict transfer it accepts is state-specific in nature, but Reback (2008) notes that the amount is generally greater than the marginal cost of educating an additional student.

Along with these three foundational features of interdistrict open enrollment policy, two additional dimensions of the transfer programs—transportation and desegregation policies—warrant discussion. A major challenge in implementing open enrollment policies involves transporting students to schools located outside of their district of residence. In response to this challenge, a number of states place all transportation responsibilities upon the parents of transferring students, whereas another set of states mandate that the district of residence provide all necessary transportation. A third group of states does not address the issue of transportation at all in their open enrollment policies, thus leaving the issue to be sorted out by parents, the district of residence, and the district of attendance. In addition to variance in the responsibility for providing transportation, state policies also differ in the amount of funding provided to support the transportation of interdistrict transfers. Policies range from providing no transportation funding at all to fully reimbursing districts for the costs associated with busing interdistrict transfers.<sup>19</sup>

Finally, interdistrict transfer policies in a significant number of states explicitly permit districts to refuse transfers—both into and out of the district—if the transfer would violate the provisions of an established desegregation policy or otherwise upset the racial or socioeconomic balance of the district. The legality of such provisions, however, is in doubt after the recent U.S. Supreme Court decisions in *Parents Involved in Community Schools Inc. v. Seattle School District* and *Meredith v. Jefferson County (Ky.) Board of Education*, which prohibited schools and districts from considering race in school admissions processes.

*Interdistrict Open Enrollment in Colorado*

The Public Schools of Choice Act of 1990 serves as the authorizing legislation for Colorado's mandatory statewide interdistrict open enrollment program. Beginning with the 1994–95 school year, this legislation allowed students to attend any public schools located outside their district of residence without paying tuition to the nonresident district. However, as foreshadowed above, the policy specifies five conditions under which districts can legally refuse to accept a transfer application:

- A lack of space or teaching staff required to serve the student.
- The district or school is not equipped—either physically or with respect to curriculum—to serve the student.
- The student does not meet established eligibility criteria for participation in a requested program.
- Admission of the student would violate the terms of an established desegregation plan.
- The student has been expelled from another district.

Colorado's interdistrict transfer policy contains one more notable provision with respect to student admission. Specifically, the policy states that if the number of transfer applications received by a district exceeds the number of available seats, the district is urged—but not required—to give enrollment priority to applicants with a proficiency level of unsatisfactory in one or more academic subjects and who attend a low-performing public school. With respect to funding, Colorado's policy mirrors most programs nationally by disbursing state aid associated with a transferring student to the district of attendance. Finally, issues of transportation are not addressed in the relevant statutes.

Colorado's interdistrict open enrollment program quickly grew to serve a significant number of students. By the 2000–01 school year—only six years after the inception of the program—over 20,000 students were using the policy to attend a school located outside their district of residence.<sup>20</sup> Over the following decade, the program tripled in size, and today it serves in excess of 68,000 students, which represents approximately 8.1 percent of Colorado's K–12 enrollment.

*Data*

The following analyses draw on a dataset created from administrative records maintained by the Colorado Department of Education (CDE). For the 2009–10 school year, the CDE provided student-level records containing information on student enrollment, demographics, achievement, and school and district characteristics for the universe of students attending Colorado public schools. In addition to a unique student identifier, the enrollment data provided by CDE contain measures of the school attended by each student and the district in which it is located.<sup>21</sup> The data also



indicate whether a student attended a school located outside of his or her district of residence—a measure of open enrollment. For students who open enroll, the data identify the student's district of residence. The data also contain a variety of relevant contextual data for the districts that students attend, such as dropout rates, mobility statistics, disciplinary information, staff data, available postsecondary options, fiscal information, and socioeconomic composition. For students who open enroll, this information is also available for students' district of residence.

The CDE records contain information on standard demographics—age, grade, gender, and race/ethnicity—as well as measures of several other characteristics such as gifted and talented status, free or reduced lunch status, disability status, English language learner status, a measure of language proficiency, and students' primary language. The CDE records also contain students' scale scores on the reading and math portions of the Colorado Student Assessment Program (CSAP), which was administered to all students in grades 3–8 and 10 to meet the accountability provisions of the No Child Left Behind Act. To facilitate cross-grade comparisons, I standardized the CSAP scale scores using the statewide mean and standard deviation for the proper grade and subject. Taken as a whole, the dataset contains nearly 900,000 observations—the universe of students attending Colorado public schools in 2009–10. I have extensive information on each student's demographic and achievement profile, as well as data on the schools that students attend and the districts in which they reside. In short, the data are well suited for analyses that will provide significant insight into the stratifying effects of interdistrict open enrollment.

### *Interdistrict Open Enrollment and Stratification*

To determine how Colorado's interdistrict open enrollment program affects cross-district stratification levels, I perform a three-step analysis using the data described above. The first step involves calculating the two segregation measures described previously across Colorado's 183 school districts when the interdistrict choice program is in place. Specifically, using the formulas presented in equations 1 and 3, I calculate the dissimilarity and isolation indexes, respectively, on the basis of students' district of attendance. These calculations provide measures of cross-district segregation with the policy in effect. I calculate the dissimilarity and isolation indexes along several dimensions, including socioeconomic status, student achievement, and race/ethnicity.<sup>22</sup> I perform this calculation separately for the entire state and districts located in two geographic areas—the Denver (including Fort Collins) and Colorado Springs/Pueblo/Grand Junction metropolitan statistical areas (MSA). Although the MSA results are likely the most interesting from a policy standpoint, the statewide nature of the program renders those results important to present.

The second step of the analysis proceeds under the assumption that Colorado's interdistrict choice program is eliminated. Under this counterfactual, all students would be required to attend school in their district of residence, a measure contained in the dataset underlying the analyses. On the basis of students' district of residence, I again use the formulas presented in equations 1 and 3 to calculate the dissimilarity

and isolation indexes in the absence of interdistrict choice. Such a calculation provides a measure of interdistrict segregation when students are forced to attend their district of residence.

As the final step in the analysis, I subtract the measures of segregation calculated without existence of the interdistrict choice program from their respective analogs calculated with the choice program in place. That is, using formulas similar to those presented in equations 2 and 4, I calculate the change in the dissimilarity and isolation indexes attributable to the choice program.

Implicit in this approach is the assumption that families would exhibit no behavioral responses to elimination of the interdistrict choice program. That is, the analysis assumes that elimination of the choice program will result in prior participants attending a public school in their district, rather than moving to a different school district, enrolling in a private school, or taking some other action besides enrolling in their district of residence. Such an assumption is likely defensible in the short term, but less likely to hold up in the long run, as recent research indicates that interdistrict choice programs induce behavioral responses (e.g., Brunner, Cho, & Reback, 2012). Similarly, the analysis assumes that districts would not respond to the presence or elimination of the choice program in a manner that would affect stratification levels. Furthermore, it must be noted that this analysis only addresses district-level segregation and sheds little light on how interdistrict choice programs affect stratification at the school level. Even with these limitations, the empirical analysis of the Colorado context serves to improve our understanding of the operations and effects of interdistrict choice programs.

The results of the analysis described above are presented in Tables 7 and 8; Table 7 presents the results for the dissimilarity index, and Table 8 presents the results for the isolation index.<sup>23</sup> Looking first at the statewide results in Table 7, with the interdistrict choice program in place—the status quo—the results demonstrate that the highest cross-district stratification levels occur on the basis of race, at least among the three dimensions I examine. The results indicate that the dissimilarity index for black students—relative to white students—is substantially larger than the same index for Hispanic students, again relative to white students. However, the results also indicate that—for both black and Hispanic students—Colorado's interdistrict choice program actually results in lower levels of stratification than would occur if students were required to attend their district of residence; the program produces decreases in stratification along the dimension of race/ethnicity. Although the magnitude of these decreases are small for both black and Hispanic students, it is somewhat larger for black students than Hispanic students. Inspection of the results broken down by geographic area reveals that these results are driven primarily by the Denver Metropolitan Area. Indeed, outside of Denver interdistrict choice slightly increases racial/ethnic stratification. The results for the isolation index—presented in Table 8—are substantively similar.

The results in Tables 7 and 8 also indicate that Colorado's interdistrict open enrollment program results in slight statewide increases in socioeconomic stratification, at least as measured by free lunch eligibility. This pattern holds across all geographic areas for both segregation measures. There is more variability across

Table 7. Dissimilarity Index on Several Characteristics in 2009–10 from Empirical Analysis of Colorado: With and without Open Enrollment

Status	Free Lunch	Reading Achievement	Math Achievement	Black	Hispanic
With open enrollment	0.3667	0.2138	Statewide	0.5563	0.4136
Without open enrollment	0.3632	0.2134		0.5685	0.4214
Change	0.0035	0.0004		-0.0122	-0.0078
With open enrollment	0.3807	0.2479	Denver Metropolitan Area (Includes Fort Collins)	0.5861	0.4355
Without open enrollment	0.3787	0.2484		0.6003	0.4462
Change	0.0020	-0.0005		-0.0142	-0.0107
With open enrollment	0.4175	0.1613	Colorado Springs/Pueblo/Grand Junction Metropolitan Areas	0.4090	0.3168
Without open enrollment	0.4054	0.1503		0.3993	0.3125
Change	0.0121	0.0110		0.0097	0.0043

Note: Columns titled “Reading Achievement” and “Math Achievement” calculate the dissimilarity index between students who are above the statewide mean and those who are below the mean. In the remaining columns, the dissimilarity index is calculated between students who possess the relevant characteristic and those who do not.

Table 8. Isolation Index on Several Characteristics in 2009–10 from Empirical Analysis of Colorado: With and without Open Enrollment

Status	Free Lunch	Reading Achievement	Math Achievement	Black	Hispanic
			<i>Statewide</i>		
With open enrollment	0.4091	0.4818	0.5098	0.2570	0.4640
Without open enrollment	0.4069	0.4811	0.5095	0.2688	0.4647
Change	0.0022	0.0007	0.0003	-0.0118	-0.0007
			<i>Denver Metropolitan Area (Includes Fort Collins)</i>		
With open enrollment	0.4165	0.4923	0.5095	0.2862	0.4896
Without open enrollment	0.4144	0.4920	0.5101	0.2988	0.4923
Change	0.0021	0.0003	-0.0006	-0.0126	-0.0027
			<i>Colorado Springs/Pueblo/Grand Junction Metropolitan Areas</i>		
With open enrollment	0.3845	0.4426	0.4931	0.1977	0.3795
Without open enrollment	0.3797	0.4419	0.4943	0.1962	0.3778
Change	0.0048	0.0007	-0.0012	0.0015	0.0017

Note: Columns titled “Reading Achievement” and “Math Achievement” calculate the isolation index between students who are above the statewide mean and those who are below the mean. In the remaining columns, the dissimilarity index is calculated between students who possess the relevant characteristic and those who do not.

these areas, however, when it comes to the relative magnitudes of racial/ethnic and socioeconomic stratification. Because the dissimilarity index is invariant to group size, the results in Table 7 provide a better gauge of relative segregation levels across groups. The results indicate that in Denver socioeconomic stratification levels are lower than the corresponding levels along the racial/ethnic dimension. This pattern of results suggests that—at least in the Denver area—Colorado’s interdistrict open enrollment program may be disproportionately used by nonpoor racial and ethnic minority families, a possibility I explore in greater detail in the following section.

Finally, the results presented in Table 7—and Table 8 to a lesser extent—indicate that stratification on the basis of academic achievement is relatively small in Colorado, at least relative to socioeconomic and racial/ethnic stratification. Furthermore, the results indicate that the interdistrict choice program has little substantive effect on stratification levels.

### *The Role of Selection and Schooling Decisions*

The results presented in the previous section demonstrate that Colorado’s interdistrict open enrollment program reduces cross-district stratification along the dimension of race/ethnicity but produces a slight increase along socioeconomic and achievement dimensions. In this section, I assess the roles of selection and schooling decisions in producing these observed outcomes.

To assess the role of selection in producing the results contained in Tables 7 and 8, I examine the characteristics of interdistrict open enrollment participants in 2009–10. Table 9 presents the proportion of individuals with each characteristic described above—free lunch eligibility, low and high achieving, and the three racial/ethnic groups—that participated in interdistrict open enrollment in 2009–10. It also presents participation rates further broken down by a second characteristic. For example, for each racial/ethnic group, it presents participation rates separately for students who are and are not eligible for free lunch. These rates are presented separately by urbanicity—statewide, large urban districts, suburban districts, and non-urban or suburban districts.<sup>24</sup>

The results are largely consistent with selection producing the observed results, a finding that mirrors the results of the theoretical analysis. Specifically, the statewide results indicate that black students are more likely to open enroll than white students and that students eligible for free lunch are less likely to open enroll than their more affluent peers. These results are consistent with the finding that Colorado’s interdistrict choice program results in a slight increase in socioeconomic stratification but a slight decline in stratification levels between black and white students. Furthermore, the negligible difference in open enrollment participation between low- and high-achieving students is consistent with the results indicating Colorado’s interdistrict choice program to have little effect on achievement-based stratification. The sole result in Table 9 that may appear somewhat inconsistent with the findings presented above concerns Hispanic participation in interdistrict open enrollment. Tables 7 and 8 demonstrated that—at the state level and within the Denver

**Table 9.** Open Enrollment Participation Rates in 2009–10 from Empirical Analysis of Colorado by Urbanicity and Selected Characteristics

Characteristic	Open Enroll Statewide	Open Enroll Urban	Open Enroll Suburban	Open Enroll Other
Race/ethnicity				
White	6.67	13.48	5.42	7.16
Free lunch	6.12	8.48	5.76	5.72
No free lunch	6.77	15.21	5.38	7.51
Hispanic	5.51	6.86	6.09	3.75
Free lunch	4.13	4.67	5.01	2.49
No free lunch	7.45	12.31	7.30	5.49
Black	7.73	7.44	8.25	4.69
Free lunch	6.09	5.27	7.12	3.11
No free lunch	9.21	10.99	9.03	5.82
Free lunch status				
Free lunch	4.92	5.51	5.43	3.81
No free lunch	6.99	13.82	5.88	7.13
Achievement				
Low achieving—reading	5.43	7.25	5.18	4.87
White	5.99	12.93	4.73	6.41
Black	6.85	6.86	7.18	3.56
Hispanic	4.68	5.39	5.40	3.04
Free lunch	4.20	4.48	4.74	3.17
No free lunch	6.57	14.25	5.50	6.33
High achieving—reading	6.16	11.99	5.17	6.20
White	5.86	14.17	4.47	6.64
Black	8.59	8.93	8.88	5.30
Hispanic	6.58	9.12	7.20	4.39
Free lunch	5.78	7.64	6.04	4.45
No free lunch	6.24	14.32	5.03	6.67

*Note:* Low-achieving students defined as those below the statewide mean. High-achieving students defined as those above the statewide mean.

MSA—the choice program reduced stratification levels between Hispanic students and white students, a somewhat surprising finding given that Table 9 indicates that Hispanic students are less likely to open enroll than white students. I investigate this pattern further in the following analyses.

The statewide results mask considerable heterogeneity across urbanities. For example, whereas only 6.7 percent of white students open enroll statewide, nearly 13.5 percent of white students in urban districts do so, a number that rises to over 15 percent when considering only those students ineligible for free lunch. In contrast, only 5–7 percent of white students in suburban and other areas use interdistrict open enrollment. For black students, those who reside in the suburbs are most likely to open enroll—with over 8 percent doing so. Participation rates for black students in urban and other areas are 7 and 5 percent, respectively. Among the three racial/ethnic groups, Hispanic students exhibit the lowest participation rates, both statewide and across every urbanicity. Table 9 also reveals that students ineligible to receive free lunch are much more likely to open enroll than their eligible peers. The difference in participation rates between students who are and are not eligible for free lunch is largest in urban areas but present across all urbanities and each racial/ethnic group.



To assess how participants' schooling decisions interact with the selection effects presented above, Table 10 presents the average district-level characteristics—percent free lunch, percent black, percent Hispanic, percent white, reading achievement, and math achievement—for open enrolling students. The characteristics are presented separately for students' district of residence and their district of residence, and they reveal an interesting story.

With respect to socioeconomic stratification, the results demonstrate that both students who are and are not eligible to receive free lunch open enroll into districts with a lower percentage of students eligible to receive free lunch, relative to their district of residence. Moreover, the average decrease in the proportion of students eligible for free lunch between students' district of residence and district of attendance is larger for open enrollers eligible for free lunch than those who are not. This fact is evidenced by Table 11, which presents the difference in average district characteristics between open enrollers' district of residence and their district of attendance. In this case, differences in schooling decisions across groups work to offset the selection-induced stratification, just not to the extent where the choice policy produces a net decrease in socioeconomic stratification.

Similar processes are observed with respect to stratification along racial/ethnic dimensions. Tables 10 and 11 demonstrate that white students, black students, and Hispanic students all open enroll into districts with a greater percentage of white students than their district of residence. In addition, the average difference between the percentage of white students in students' district of residence and their district of attendance is larger for black and Hispanic students than it is for white students. Consequently, for black students, schooling decisions made through the program work to reinforce the de-stratifying effects of open enrollment participation patterns (i.e., selection). For Hispanic students, their tendency to enroll into districts with a significantly larger proportion of white students—relative to their district of residence—offsets the fact that they are slightly less likely to open enroll than white students. This offset is large enough to result in the interdistrict choice program producing an overall decrease in stratification levels between whites and Hispanics. Finally, the achievement results demonstrate that low- and high-achieving students enroll into districts with, on average, similar levels of academic achievement. Coupled with the fact that low- and high-achieving students are equally likely to open enroll, this pattern is fully consistent with the finding that Colorado's interdistrict choice program has a negligible effect on stratification in the academic realm.

Taken together, the results in this section demonstrate that Colorado's interdistrict choice program slightly increases socioeconomic stratification while decreasing racial stratification—the magnitude of the decrease in racial stratification is larger than the increase in socioeconomic stratification. The increase in socioeconomic stratification is primarily attributable to selection—students ineligible for free lunch are more likely to open enroll than their eligible peers, particularly in urban areas. Among participants, however, differences in schooling decisions across groups serves to decrease stratification. In the realm of race/ethnicity, the decrease in stratification is driven by both participation patterns (i.e.,

**Table 10.** Characteristics of Open Enrollment Participants' District of Attendance and District of Residence in 2009–10 from Empirical Analysis of Colorado by Selected Characteristics

Characteristic	Percent Free Lunch	Percent Black	Percent Hispanic	Percent White	Average Reading Achievement	Average Math Achievement
<i>District of Attendance</i>						
Race/ethnicity						
White	28.8	4.4	30.4	61.4	0.046	0.035
Hispanic	36.0	5.6	39.1	51.5	-0.055	-0.078
Black	34.3	8.7	36.0	50.6	-0.040	-0.033
Free lunch status						
Free lunch	36.4	5.8	37.4	53.0	-0.054	-0.071
No free lunch	29.4	4.8	31.7	59.5	0.036	0.024
Achievement						
Low achieving—reading	32.3	5.0	34.4	56.7	-0.004	-0.024
High achieving—reading	29.0	4.7	31.0	60.4	0.074	0.052
Low achieving—math	32.0	5.0	34.3	56.8	0.001	-0.025
High achieving—math	28.9	4.7	30.7	60.6	0.081	0.061
<i>District of Residence</i>						
Race/ethnicity						
White	36.7	4.7	36.2	55.4	0.035	0.046
Hispanic	48.1	6.8	49.2	40.2	-0.078	-0.055
Black	47.0	12.2	45.2	37.9	-0.033	-0.040
Free lunch status						
Free lunch	47.4	7.3	46.4	42.3	-0.071	-0.054
No free lunch	38.2	5.4	38.3	52.4	0.024	0.036
Achievement						
Low achieving—reading	44.6	6.4	44.1	45.6	-0.024	-0.004
High achieving—reading	39.1	5.4	39.1	51.7	0.052	0.074
Low achieving—math	44.1	6.3	43.7	46.2	-0.025	0.001
High achieving—math	39.0	5.4	39.1	51.7	0.061	0.081

*Note:* Low-achieving students defined as those below the statewide mean. High-achieving students defined as those above the statewide mean.

Table 11. Difference between Open Enrollment Participants' District of Residence and District of Attendance on Selected Characteristics in 2009–10 from Empirical Analysis of Colorado

Characteristic	Percent Free Lunch	Percent Black	Percent Hispanic	Percent White	Average Reading Achievement	Average Math Achievement
<i>District of Residence—District of Attendance</i>						
Race/ethnicity						
White	7.8	0.3	5.8	-6.0	-0.012	0.012
Hispanic	12.1	1.2	10.0	-11.2	-0.023	0.023
Black	12.7	3.5	9.2	-12.7	0.007	-0.007
Free lunch status						
Free lunch	11.0	1.5	9.0	-10.6	-0.017	0.017
No free lunch	8.9	0.6	6.6	-7.1	-0.012	0.012
Achievement						
Low achieving—reading	12.3	1.4	9.8	-11.1	-0.021	0.021
High achieving—reading	10.1	0.7	8.1	-8.7	-0.022	0.022
Low achieving—math	12.1	1.3	9.4	-10.6	-0.026	0.026
High achieving—math	10.1	0.7	8.4	-8.9	-0.020	0.020

Note: Low-achieving students defined as those below the statewide mean. High-achieving students defined as those above the statewide mean.

selection) and schooling decisions.<sup>25</sup> The program has no meaningful effect on academic stratification.

### Discussion and Conclusion

Much previous work on the relationship between school choice and educational stratification relies on theoretical arguments (e.g., Gutmann, 1987; Viteritti, 1999) or draws conclusions based on empirical analyses of a single context (e.g., Figlio et al., 2010; Howell, 2004; Witte, 2000; Witte & Thorn, 1996; Wolf et al., 2005). This paper builds on these previous studies by developing a theoretical world and using simulation techniques to develop an understanding of the conditions under which an interdistrict choice policy will lead to increases or decreases in stratification. Using the lessons learned from this theoretical analysis, the empirical application assesses how selection—and student participation more generally—and heterogeneity in schooling decisions across groups relate to the observed stratifying effects of Colorado's interdistrict choice program along three dimensions: race/ethnicity, socioeconomic status, and academic achievement.

A number of interesting findings emerge from the theoretical analysis. First, the simulations demonstrate that in the hypothetical three-district world, which is designed to mirror the educational context in many large metropolitan areas, an interdistrict choice policy decreases stratification in a greater number of trials when participants are disproportionately low achieving, or when low- and high-achieving students are equally likely to participate, relative to a case where participants are disproportionately high achieving. This finding is consistent regardless of the schooling choices that participants make. Moreover, the number of trials in which the interdistrict choice program decreases stratification increases as the initial level of segregation rises. Finally, relative to a world without any supply constraints, limiting the number of available seats in a high-achieving district increases, if only slightly, the number of trials in which the interdistrict choice program reduces stratification.

Interesting insights also emerge from the empirical analysis of Colorado's interdistrict choice program. For example, the statewide results reveal that the program produces a decrease in racial/ethnic stratification, a slight increase in socioeconomic stratification, and no meaningful effect on academic stratification, although there is some evidence of heterogeneity in these results across MSAs. The analysis suggests that both student participation patterns and heterogeneity in schooling decisions across groups contribute to the observed effects of Colorado's interdistrict open enrollment on stratification levels, although the effects of these two factors vary across the three dimensions studied in the empirical analysis. These findings have several implications for both research and policy.

With respect to research, the analysis demonstrates the importance of not only assessing the overall effect of a school choice policy on stratification levels but also working to gain insight into the factors responsible for producing the observed outcomes. Assessing whether increases or decreases in stratification are the result

of selection, heterogeneity in schooling decisions, or a combination of the two factors is a precondition for research into the relationship between school choice policies and educational stratification to be useful in efforts to develop better policy, however defined. Similarly, this paper exhibits the importance for researchers to analyze the stratifying effects of a school choice program along several dimensions; the results for racial/ethnic stratification could very well differ from those along socioeconomic or academic dimensions. Gaining a broad understanding of the effects—as opposed to analyzing only a single dimension—can facilitate an honest policy dialogue on the issue.

In addition to their implications for research, the results presented above can also inform policy. By demonstrating that—depending on the circumstances—school choice policies can produce both increases and decreases in stratification levels, the paper illustrates the importance of policy design. Specifically, policies that are designed to target one group for participation—whether along socioeconomic, academic, or other characteristics—are likely to affect stratification levels in a particular way. Similarly, stratification levels are likely to be affected in predictable ways if policies shape the schooling preferences and decisions of program participants in certain manners. Policymakers should be aware of these realities and actively consider how the design of a policy might affect participation patterns, schooling decisions and, ultimately, stratification levels.

There is an argument to be made that the conditions under which interdistrict choice produces the largest declines in stratification—where participants are disproportionately disadvantaged and reside in the large central city district—are the most difficult to realize from an empirical or political standpoint. Thus, if a decrease in stratification is a goal policymakers hope to achieve through interdistrict choice policies, they must be aware of these realities and actively consider how the design of a policy might affect participation patterns and schooling decisions. Furthermore, they need to anticipate the political opposition that may arise—from both the central city districts that stand to lose students and the suburban districts that serve as potential transfer options—and have a plan for addressing such opposition while still implementing a policy that can achieve any desired goals.

Looming over all the analyses presented in this paper are contentious normative and political issues. Even a policy that produces an overall decrease in stratification levels may have undesirable effects on a given district or set of districts. Similarly, as evidenced by Colorado's interdistrict open enrollment program, a choice policy may decrease stratification along one dimension but increase it along another. More generally, as with most policies, there will almost certainly be trade-offs with a school choice policy. Whether the trade-offs at hand are acceptable or desirable is a question that no amount of theoretical or empirical analysis can answer—the resolution must be left to the political process. Analyses such as this one can, however, inform those discussions and deliberations.

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## Notes

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1. Most previous research on the relationship between school choice and stratification has been conducted in the context of either private school voucher programs or charter schools. The analyses in this paper, however, are performed in the context of interdistrict open enrollment. Because all three of these school choice policies are framed—both theoretically and politically—as market-based reforms, analyses of one program are undoubtedly germane to analyses of another. At the same time, however, interdistrict open enrollment differs from these other choice policies in important ways that warrant discussion. First, families' schooling choices under most charter and voucher policies are made at the school level—they apply to attend a particular school—whereas choices under interdistrict open enrollment are made at the district level. To the extent that school- and district-level choice structures generate different patterns of stratification, existing studies will provide an imperfect analog to the analyses presented below. Second, these three policies often differ in their geographic scope. Although charter school policies—and increasingly private school voucher policies—are typically statewide in theory, in practice, these choice programs operate almost exclusively in large urban areas. In contrast, research shows that every district in a state is generally affected by interdistrict open enrollment policy (Carlson, Lavery, & Witte, 2011), even if most participation occurs in large metropolitan areas. Finally, these policies may differ in the extent to which families' choices are constrained by supply-side factors. For example, most charter school policies place relatively few constraints on families' choices—the major factor inhibiting enrollment in a given charter school is generally capacity. Families typically face more constraints in acting on their schooling preferences in the context of private school voucher policies. First, just qualifying to participate in these programs has historically required households to fall below an income ceiling and to reside in a defined geographic area, although these constraints have been eased by recent legislation in several states, such as Indiana, Louisiana, and Wisconsin. Second, even if families meet all eligibility criteria and obtain a voucher, their educational options in the private sector are restricted to schools that have received state approval to enroll voucher students and have the capacity to provide services to those students. Interdistrict open enrollment programs are also designed in a manner that may constrain families' schooling decisions. Although most interdistrict choice policies are designed to allow anyone to attend a school located outside their district of residence, potential receiving districts are generally allowed to refuse transfer applications for any of several reasons, including a lack of capacity, a history of disciplinary issues with the applicant, or an inability to meet the educational needs of the student. The upshot of potential supply-side constraints is the fact that observed schooling choices may not reflect families' true educational preferences. Put another way, a family may have made a schooling decision that differs from the one I observe had a larger set of options availed them. The theoretical analysis below provides the ability to make varying assumptions about supply-side constraints and explicitly examine how features of an interdistrict choice program relate to stratification levels under the various assumptions. Such luxuries are not present in the empirical analysis, where it is not possible to observe the respective roles of preferences and constraints in shaping observed choices. The language used in the empirical analysis reflects this reality—I use the term “schooling decisions” rather than “preferences” when discussing the analysis.
2. Unsurprisingly, several studies find that participants in private school voucher programs place a disproportionately high value on a religious component of education (e.g., Fleming et al., 2013; Howell, 2004; Witte, 2000). The relationship between voucher program participation and income is difficult to discern given the means-tested designs of most long-standing private school voucher programs. Fleming et al. (2013) demonstrate a nonlinear relationship between income and voucher use—the probability of use increases until a particular income threshold and then begins to decline. The relationship is undoubtedly influenced by the income ceiling for voucher eligibility, but the extent of that influence is unclear.
3. An earlier study of interdistrict open enrollment using district-level data found some indications of positive selection on observables (Carlson et al., 2011), but the aggregate nature of the data prevented verification of these indications.



4. The two student types in this world are referred to as low achieving and high achieving, but the groups could just as reasonably be defined along the basis of class (i.e., low income and high income), race/ethnicity, or other characteristics.
5. The specific numbers of low- and high-achieving students in Districts B and C are allowed to vary in the Monte Carlo simulations, which are described in greater detail below.
6. Because I assume no supply constraints in this theoretical world, preferences are the sole determinant of schooling decisions.
7. I employ uniform distributions rather than a different distribution—such as a normal distribution—to ensure a sufficient density of trials over the range of interest for purposes of the analysis.
8. If the profile of open enrollers in a district is drawn as disproportionately high achieving, then the specific proportion of high-achieving open enrollers is randomly drawn from a uniform distribution that ranges from greater than 50 percent to 100 percent. Similarly, if the profile of open enrollers in a district is drawn as disproportionately low achieving, then the specific proportion of high-achieving open enrollers is randomly drawn from a uniform distribution that ranges from greater than 50 percent to 100 percent. This two-stage approach was taken—as opposed to one where the proportion of low- or high-achieving open enrollers was simply drawn from a uniform distribution ranging from 0-100—to ensure enough cases to analyze the effects of interdistrict choice on stratification when selection was not present.
9. The dissimilarity index is invariant to group size, but the isolation index is not. That is, the isolation index increases mechanically as the size of the group increases. Such mechanical increases do not occur with the dissimilarity index. However, because overall group sizes remain constant in this analysis, and I am most interested in the change in the isolation index, the lack of invariance is relatively unproblematic.
10. It is important to be clear what these results do and do not tell us. As noted above, the primary purpose of the simulations is to clarify logical relationships between participant characteristics, schooling decisions, and stratification levels, rather than clarify predictions of a behavioral model. The simulations were designed in a manner to best achieve this purpose, but such a design results in limitations that must be acknowledged. First, the percent of trials in which interdistrict choice reduces segregation does not represent the likelihood that interdistrict choice, if implemented, would reduce segregation. Similarly, the average change in segregation in the trials does not represent the expected change in segregation if interdistrict choice were to be implemented. Recognizing that reality, the simulation results still provide valuable information. For example, given a profile of participant characteristics, the results provide insight into how different schooling decisions made by those participants would affect stratification levels. Similarly, for a given set of schooling decisions that will be made by participants, the simulations provide information on how different participant profiles relate to changes in stratification levels. Although clarification of these mechanical relationships may seem somewhat trivial, the tenor and contents of contemporary policy debates—which display a clear lack of understanding of these relationships—demonstrate that such clarification represents a valuable contribution.
11. Histograms of the distribution of changes in the dissimilarity and isolation indexes are available upon request.
12. The preceding results were obtained under assumptions about the characteristics and preferences of open enrollment participants in District B, but no assumptions were made regarding participants in the other two districts. Analyses were also performed in which assumptions regarding participant characteristics and schooling preferences were extended to open enrollment participants in all three districts. These results are substantively similar to those presented in Table 2 and are available upon request.
13. Initial segregation levels range from 0.001 to 0.756 on the dissimilarity index. For the isolation index, the analogous range is 0.418 to 0.870. These ranges comfortably encompass the segregation levels observed in the empirical analysis of Colorado (see Tables 7 and 8 below) as well as in most metropolitan areas (see Glaeser & Vigdor, 2001, for segregation levels of metropolitan areas).
14. I perform these calculations separately for the dissimilarity and isolation indexes. For the dissimilarity index, the 25th and 75th percentiles for the initial level of segregation are 0.286 and 0.509, respectively. The analogous numbers for the isolation index are 0.540 and 0.702.

15. For example, Milwaukee's Chapter 220 program provides an opportunity for students in the central city district to attend school in one of the participating suburban districts. Similarly, the cross-district program operated by the Voluntary Interdistrict Choice Corporation in St. Louis allows students in the City of St. Louis to attend suburban school districts in St. Louis County. It also allows students in the suburban districts to attend magnet schools located in the city.
16. In a related note, interdistrict choice is designed as a district level, rather than school level, policy reform, thus rendering the district an important unit of analysis.
17. There are two primary types of formal interdistrict open enrollment policies: voluntary and mandatory. Under voluntary policies, school districts are free to decide whether to accept transfers from other districts. Mandatory policies, on the other hand, require school districts to accept transfers from other districts, although state laws generally specify a set of conditions under which districts can legally refuse to accept transfers. Both voluntary and mandatory policies generally prohibit districts from restricting student transfers out of the district.
18. The eight states without some form of interdistrict open enrollment in 2011 were Alabama, Alaska, Hawaii, Illinois, Maryland, North Carolina, Virginia, and Wyoming. It is important to note that Hawaii possesses only a single school district, rendering interdistrict open enrollment impossible. Six states have both voluntary and mandatory interdistrict open enrollment policies. In most of these cases, the mandatory policies require districts to accept transfers with a specific characteristic (e.g., low test scores and a learning disability), whereas acceptance of students without the specified characteristic(s) is voluntary.
19. The Education Commission of the States maintains a database that describes several features of each state's interdistrict open enrollment policy. The database can be found at: <http://ecs.force.com/mbdata/mbtab4ne?sid=a0i70000000Xk5v&rep=OET>
20. Data on the number of students utilizing Colorado's interdistrict open enrollment program are not available prior to the 2000–01 school year.
21. More specifically, the data contain a record for each school attended by a student during the school year. The fact that the data contain multiple observations for students who attended more than one school in a given year represents a potential complication for student-level analyses. To address this issue, I implemented the following decision rule. First, for students with test scores, I kept the record containing the school in which the student was tested. This eliminated approximately half of the duplicate records. For the remaining students with multiple records—those without test scores—I kept the record in which the disposition code listing the reason that a student left a school was not applicable; in effect, I kept the student record for the school in which a student finished the year.
22. As described above, the dissimilarity index requires two distinct groups for its calculation. In the analyses to follow, the dissimilarity index along the socioeconomic dimension is calculated between students who are eligible to receive free lunch and those who are not. Separately for math and reading, the calculation along the achievement dimension distinguishes students who score above the mean (high achievers) from those who do not (low achievers). Finally, I perform two separate dissimilarity index calculations along the race/ethnicity dimension: (i) black students and white students and (ii) Hispanic students and white students.
23. Because the results in Tables 7 and 8 are based on data from the universe of students attending Colorado public schools in 2009–10, they can be interpreted as true population differences, at least for 2009–10. However, if the data are considered to be a sample of some larger population, then it is reasonable to perform significance tests to assess whether the changes in the segregation measures are statistically significant. A number of previous studies have used *t*-tests to assess whether differences in segregation measures are statistically significant (e.g., Iceland & Scopilliti, 2008; Park & Iceland, 2011), but this is problematic given how segregation indexes are calculated. Consequently, using districts as the unit of analysis, I used bootstrapping techniques to assess the statistical significance of the difference in segregation levels with and without the interdistrict choice program. Specifically, I performed 5,000 replications of the change in the dissimilarity index (or isolation index) with and without the interdistrict choice program and—using the bootstrapped standard error—assessed whether the change was statistically significant. I performed this procedure separately for each of the five groups in Tables 7 and 8 and across each of the geographic areas. Although some were close, none of the changes were statistically significant at the conventional  $p < .05$  level, a result that reinforces the

substantively small size of the segregating effects of Colorado's interdistrict choice policy. Full bootstrap results are available upon request.

24. Denver and Colorado Springs are classified as urban districts, and the other districts within those MSAs are classified as suburban districts. All other districts fall into the "Other district" category.
25. This pattern is particularly clear for black students. They are more likely to open enroll than white students and, relative to white students, exhibit larger increases in the percentage of white students between their district of residence and district of attendance. Hispanic students are actually somewhat less likely to open enroll than white students, but they also exhibit larger increases in the percentage of white students between their district of residence and district of attendance, relative to white participants.

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